Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

NOTES ON SOME WESTERN UREDINEAE WHICH ATTACK FOREST TREES[1]

GEORGE GRANT HEDGCOCK

The following paper is summarized from field notes on a number of heteroecious rusts on forest trees in the western United States.

1. PERIDERMIUM FILAMENTOSUM Peck

This fungus is the cause of a very serious disease of the western yellow pine (*Pinus ponderosa* Laws.) in portions of Colorado, and probably in adjacent sections of New Mexico and Arizona. This fungus was first discovered by Pringle[2] in the Santa Rita Mountains in Arizona, July 13, 1881. Although very abundant in certain localities in Montezuma and San Juan National Forests in southern Colorado, it was first discovered in Montezuma National Forest by F. B. Notestein (F. P. 190) the latter part of June, 1910. This collection was the second recorded, a portion of which was sent to Dr. J. C. Arthur and identified by him. Mr. Notestein again collected it on June 26, 1911 (F. P. 1888). Since then the fungus was collected by the writer July 8, 1911, on Pikes Peak, Colorado, in Pike National Forest, in East San Juan National Forest, July 13, 1911, near Pagosa Springs, Colorado, and in the Montezuma National Forest July 19, 1911, near Nancos, Ariz., (F. P. 9085). Mr. Notestein reports it as occurring abundantly in various parts of Montezuma National Forest. A tree apparently diseased with the fungus was noted enroute near Telluride, Colorado, July 19, 1911.

This species of *Peridermium* attacks the twigs, limbs, and trunks of both young and old trees in the cambium, but producing little or no swelling of the parts affected. There is a tendency occasionally towards witches broom formation where side limbs are attacked, such limbs usually being more pendant than normal ones, being slightly thickened and clustered, resembling slightly the limbs in the pendant witches brooms formed by the stimulation of the mistletoe, *Razoumofskya cryptopoda* (Eng.) Coville. The fungus apparently spreads through the cambium of twigs, often entering the new growth each year. The effect of the fungus on the growth of such twigs is in some instances to slightly increase the number of twigs produced, and to increase their diameter; but usually there is no swelling produced. In a number of older trees, 75 to 150 years old, the apparent effect of the fungus on the main limbs had been to cause cankered areas to form, and to kill the entire tops, producing spike-topped trees. Such trees finally die, probably from the effects of insects or fungi which follow the weakening effects of the *Peridermium*. A large number of trees have either been stunted or slowly killed by this fungus in the Montezuma National Forest. Judging from the age and condition of many of the affected trees, the fungus has been present in this region for many years.

---

[1] Published by permission of the Secretary of Agriculture.

[2] Arthur, J. C., and Kern, F. D. North American species of *Peridermium*. Bull. Torrey Club 33: 418. 1906.

On Pikes Peak, beneath the trees diseased with *Peridermium filamentosum* only one rust was found which could be associated with this fungus as a telial form. The leaves of *Castilleja integra* A. Gray were found diseased with the uredinia of *Cronartium coleopsorides* (Dietel & Holway) Arthur during the second week in July, 1911. In the forest near Mancos, Colo., a few sori with the telia of the same fungus was found on the same species of *Castilleja* near some western yellow pines diseased with *Peridermium filamentosum*.

Peridermium filamentosum[3] or a closely related species was also found by Dr. E. P. Meinecke and Mr. W. H. Long, in Lassen National Forest, September 16, 1911, on the limbs and twigs of *Pinus contorta* Loud. In the immediate vicinity, *Cronartium coleosporoides* was found on a species of *Castilleja,* furnishing additional proof of the possible relation of the latter species of fungus to *Peridermium*. Inoculations will be made to verify this assumption of relationship between *Peridermium filamentosum* and *Cronartium coleosporoides* the coming season.

[3] This specimen has since been identified by Mr. W. H. Long as *Peridermium stalactiforme* Arth. and Kern.

Peridermium filamentosum apparently has been held in limited areas for a long time by natural boundaries to certain forests, viz., the treeless region separating the mountain ranges in Colorado, New Mexico, and Arizona. The fungus should be made the subject of further investigation, and watched closely, since its effect on seedling trees is much like the dreaded *Cronartium ribicola* Fischer (*Peridermium strobi* Kleb.) in Europe. It certainly should not be allowed to invade any of the forest tree nurseries in the West, from which it might be disseminated over a much greater region than its present habitat, and as a result great damage be done to our magnificent western yellow pine and related species.

2. PERIDERMIUM HARKNESII Moore

This species of *Peridermium* is found attacking the following species of pines in our western forests: *Pinus contorta* Loud., *P. Jeffreyi* " Oreg. Com.," *P. ponderosa* Laws., *P. radiata* Don., and *P. sabiniana* Dougl. The range of the species is from Colorado northward to Montana, and westward to Washington, Oregon, and California. It is most common on the lodgepole pines in the forests of the Rocky Mountains.

Peridermium harknesii has an effect on pines almost identical with that of *Peridermium cerebrum* Peck on pines in eastern and central United States. Globose or oblong galls or burls, varying in diameter from a pea to more than a foot are formed, usually surrounding the twigs, limbs, and trunks at the point of attack. Rarely a witches broom formation of limbs or twigs just above the galls takes place. Young trees attacked are often killed by the interference of the galls with the growth beyond the point of attack. In such cases the galls apparently have a strangulating effect. The fungus persists in the cambium of the galls for many years, but as in case of *Peridermium cerebrum,* rarely fruits annually. Apparently the older the galls become, the less frequently the aecia are formed on the surface.

Repeated and careful inoculation with aeciospores of this *Peridermium* on the leaves of young oaks of a number of species failed to infect them, while at the same time, inoculations with *Peridermium cerebrum* Peck on the same species of oak trees brought about an infection, resulting in the uredinia and telia of *Cronartium quercum* (Brond.) Arth.

In nature, there is constantly associated with *Peridermium harknesii* a species of *Coleosporium* on a number of species of *Aster.* This association was found so constantly this year, as to venture the prediction that the *Coleosporium* may be a telial form of this species of *Peridermium.* It is very evident that the telial form cannot be a *Cronartium* on oaks, since none are found in an immense region in the Northwest, where this fungus occurs on the pines. It occurs where there are no oaks within a thousand miles.

Peridermium harknesii, like *P. cerebrum,* kills many young pines, but is not to be considered as dangerous a species as *P. filamentosum* in its effects on older trees, because it does not have the ability like the latter to spread along the limbs from the point of infection, but remains confined to the galls it forms.

3. PERIDERMIUM MONTANUM Arth. & Kern

This species of *Peridermium* attacks the leaves of *Pinus contorta* Loud. in the Northwest, but is not so widely disseminated as *P. harknesii.* It exerts an injurious effect on the leaves at the time it forms its aecia, owing to the bursting of the epidermis of the leaves by the pustules of the fungus. The leaves lose water, and gradually die, in fact, live but a short time after the aecia mature. This causes a premature shedding of the leaves, so that where a lodgepole pine, if healthy, would bear 5 to 7 years' foliage, trees after being attacked by an epidemic of this *Peridermium* usually bear only 2 to 3 years' growth of needles, all of which except the youngest, are plainly diseased.

This fungus was found epidemic this year only in a small area in Gallatin National Forest, near Bozeman. A species of *Coleosporium* was found present in great abundance on the leaves of two species of *Aster* in immediate proximity to badly infected pines. The *Coleosporium* is very injurious to the leaves of the asters. From this it is possible that the telial form of *Peridermium montanum* may be a species of *Coleosporium* on *Aster.* A further study will be made of both species of rust.

4. PERIDERMIUM COLORADENSE (Dietel) Arth. & Kern

This species of *Peridermium* attacks the spruces, *Picea engelmanni* Eng., *Picea parryana* (André) Parry, and *Picea sitchensis* (Bong.) Trautre & Mayer. On the Engelmann spruce, it is found almost throughout the entire range of the species. It causes the formation of dense, deciduous, leafy, witches brooms, with greatly metamorphosed, stunted branches. The presence of the brooms usually bring about, in a few years, the death of the limbs upon which they are situated. If the limb is adjacent to the trunk, its death is often followed by the entrance of the heart-rotting fungus *Trametes pini* (Brot.) Fr.

In the region near Anaconda, Montana, where the forest trees have been killed by smelter fumes, it was noted that these witches brooms are more sensitive to the fumes than the healthy portions of the trees, and that they succumb first from their effects. The telial form of this species of *Peridermium* has not been found.

5. MELAMPSORELLA ELATINA (Alb. & Schw.) Arth.

The aecial form of this rust (*Peridermium elatinum* Kunze & Schmidt) attacks a number of species of *Abies*. It forms leafy witches brooms with adherent leaves and metamorphosed branches. These brooms have a stunting effect on the limbs upon which they occur. Where a number of brooms occur on the same tree, the whole tree is decidedly checked in its growth. The following species of *Abies* in the national forests of the west and northwest are attacked by this fungus: *A. balsamea* (Linn.) Mill., *A. concolor* (Gord.) Parry, *A. grandis* Lindl., *A. lasiocarpa* (Hook.) Nutt., *A. nobilis* Lindl., and *A. magnifica* Murr.

According to Arthur,[4] the uredinial and telial forms of this *Peridermium* occur on species of *Alsine* and *Cerastrum*. No effort has been made on the part of the writer to collect specimens of telia, as all collections were made too early in the season to find the telia. The aecia mature in the west from early July in New Mexico to the middle of August in northern Montana. The same variation in the maturing of aecia was noted in case of *Peridermium coloradense*.

[4] North American Flora 7: 111, Mar. 1907.

6. PERIDERMIUM PSEUDO-BALSAMEUM (D. & H.) Arth. & Kern

This or closely related species of *Peridermium* attacks the leaves of the following species of conifers: *Abies grandis, A. lasiocarpa,* and *A. nobilis.* The great resemblance of these forms of *Peridermium* to the aecial form of *Calyptospora columnaris* (Alb. & Schw.) Kühn. puts our determination slightly in doubt.

The aecia are usually found sparsely in rows on the leaves of the trees attacked, occurring usually only on scattering leaves, so that the effect on the vitality of the tree is of little consequence. No epidemics of this fungus have been noted, and it has been found only on younger trees as a rule. It is frequently found associated with a *Melampsora* on species of *Vaccinium,* and may be the aecial form of a species of *Melampsora* or *Calyptospora.* This, owing to the presence of other aecia in the vicinity where collections were made, should be taken only as a suggestion for future experiments. More careful studies will be made to determine the exact relationship of these rusts on the leaves of various species of *Abies* to *Melampsora* on species of *Vaccinium.*

7. PERIDERMIUM CONORUM-PICEA (Russ) Arth. & Kern

This species occurs in the west occasionally on the cones of *Picea engelmanni* Eng., causing them to be abortive. The only apparent harm done is in lessening the seed crop, but the fungus has never been found in sufficient abundance to be considered a serious hindrance to reforestation. The alternate form of the fungus has not been found.

8. CAEOMA CONIGENEUM Patouillard[5]

This species of *Caeoma* is one of the little-known forms. It attacks the cones of *Pinus chihuahuana* Eng., rendering them abortive. It occurs frequently on this host in southern Arizona, but aside from lessening the seed production, apparently does not injure the trees attacked. The telial form of this rust is unknown.

---

[5] Journal de Botanique 10: 386. 1896.

9. UREDO (MELAMPSORA) BIGELOWII (Thüm.) Arth.

The aecial form of this rust on larches has not been collected as yet by the writer in the national forests, but it may be common, and if search were made at the right season, it might be found. The uredinial and telial forms are found on nearly every species of willow in the west and southwest, not only where larches are found, but where there are none within a thousand miles. It has been collected on the following species of *Salix: Salix amygdaloides* Anderss., *S. bebbiana* Sarg., *S. cordata lutea* (Nutt.) Bebb., *S. cordata mackenziana* Hook., *S. fluviatilis* Nutt., *S. laevigata* Bebb., *S. lasiandra* Benth., *S. lasiandra caudata* (Nutt.) Sudw., *S. lucida* Muehl., *S. nigra* Marsh., *S. nuttalii* Sarg., and *S. sessifolia* Nutt.

The telial form of the fungus fruits so abundantly on some species as to exert a decidedly stunting effect. On the willows cultivated by the Forest Service near Washington, D. C., for experiments in making baskets, it is a serious parasite.

10. UREDO (MELAMPSORA) MEDUSAE (Thüm.) Arth.

Species of poplar are commonly attacked by the uredinial and telial forms of this rust, but the aecial forms, supposedly on larches, have not been found. It has been collected on the following species of trees: *Populus acuminata* Rydb., *P. angustifolia* James, *P. balsamifera* L., *P. grandidentata* Michx., *P. tremuloides* Michx., and *P. trichocarpa* Torr. & Gr., chiefly in the west and northwest. It occurs so abundantly on some species as *P. acuminata* and *P. trichocarpa,* that it injures the leaves and arrests the growth of younger trees.

OFFICE OF INVESTIGATIONS IN FOREST PATHOLOGY,
BUREAU OF PLANT INDUSTRY,
WASHINGTON, D. C.